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ABSTRACT

The development of a computer-based instructional management system for the Duluth, Minnesota school system is described. The project is designed to relate observed or measured student learning in cognitive and affective areas to the costs of instructional services. Individual student data are used for the cost-effectiveness analyses supported by the system, thus permitting the evaluation of individualized instruction programs. Examples of the data collection forms for individual students and for classroom activities are provided. (DGC)

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IMPLEMENTATION OF A STUDENT BASED INSTRUCTIONAL MANAGEMENT INFORMATION SYSTEM

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IMPLEMENTATION OF A STUDENT BASED INSTRUCTIONAL MANAGEMENT INFORMATION SYSTEM

Department of Planning and Evaluation
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Duluth, Minnesota

The Duluth Public Schools are presently engaged in a developmental project directed at establishing a computer based instructional-management system. The project is designed to relate observed or measured student learning in cognitive and affective areas to the costs of instructional services directed at those areas.

The system represents the coordination of over 200 inter-dependent planning, management and evaluation tasks. During the initial implementation phase the system was applied to categorically funded Federal programs. The greatest portion of the developmental activities were a part of an E.S.E.A. Title III effort entitled "Duluth Consolidated Grants and Program Management Project". The system is based on the observation that all programs need be supplemental and complementary if they are to produce the most efficient means for attaining educational goals.

In all aspects of the information system the individual student is the unit of analysis and the system is adaptable

to varying degrees of structure for individualization of instruction. The procedures for the system's operations fall into three major phases of planning, implementation and evaluation. Each of these phases is further defined into sequenced sub-groups of developmental and operational tasks:

1. Student needs assessment (student data bank including assessment data)
2. Program development (goals, objectives, program activities)
3. Resource assessment (available resources, additional resource requirements)
4. Budget development (program budgets by district, building and objective, budget data bank)
5. Evaluation (guidelines and timelines for programs evaluation components referenced to each item of needs assessment data and to program objectives)
6. Consolidated Grants proposal (completed reports for consolidated grants proposal and consolidated grants management serving as feedback functions and quality control devices for the continued monitoring of the program activities and effects)

The keystone for the entire project is a student needs assessment. The variables included for the needs assessment were determined on the basis of the school district K-6

instructional program and by the intent and purpose of the laws funding particular projects. In the cognitive areas the needs assessment data base centers on basic skill development in reading and math. Reading assessment on all K through 6 levels is based on teacher perceptions and criterion referenced tests with grades 3 through 6 augmented by standardized achievement testing. Math assessment is based on teacher perception and standardized testing. The student needs assessment includes at all seven grade levels, teacher and special service staff perception of student needs in the categories of behavior and adjustment as well as work habits. The affective areas are defined within the context of 95 descriptive statements of child behavior grouped under 16 separate headings. The entire system of data-collection, analysis and feedback is hierarchical in form and has been computerized. Reports pertinent to the individual student, the parent, the classroom teacher, the principal of the school and the district-wide supervisor are generated each time the data treatment cycle is reiterated. The system is further augmented by a system for computer managed instruction of the reading program (Wisconsin Design for Reading Skill Development) which allows for short term formative evaluation. Illustration A presents a matrix depicting the content of reports generated versus the audiences for each report. Based on the needs identified in each classroom, the classroom

STUDENT NEEDS ASSESSMENT DATA BASE

ASSESSMENT OF EVALUATION DOCUMENT / REPORT SCOPE	ACHIEVEMENT TESTING	PERCEIVED STUDENT NEEDS	PERCEIVED STUDENT WORK HABITS AND BEHAVIOR NEEDS	BASIC SKILL MONITORING
STUDENT	INDIVIDUAL STUDENT REPORT	INDIVIDUAL STUDENT NEEDS AS PERCEIVED BY TEACHER	INDIVIDUAL STUDENT GOALS	INDIVIDUAL STUDENT PROFILE OF MASTERY/NON-MASTERY Reading Math
TEACHER/PARENT	HOME REPORT PROFILE	PRINTOUT OF INDIVIDUAL STUDENT RECORDED NEEDS	VERIFIED STUDENT NEEDS AND GOALS	PARENT REPORT FORM ON STUDENT PROGRESS Reading Math
TEACHER/CLASSROOM AND/OR GRADE LEVEL	CLASS LIST AND FREQUENCY DISTRIBUTION	STUDENT LISTS AND FREQUENCY DISTRIBUTION	STUDENT LISTS AND FREQUENCY DISTRIBUTION BY BEHAVIOR CATEGORY	STUDENT LISTS BY SKILLS STUDENT LISTS BY TOTAL PROFILE GROUP ORGANIZATION Reading Math
GRADE LEVEL DISTRICT WIDE	FREQUENCY DISTRIBUTION AND SNAP	FREQUENCY DISTRIBUTION	FREQUENCY DISTRIBUTION BY BASIC BEHAVIOR CATEGORY	FREQUENCY DISTRIBUTION OF SKILL ACQUISITION BY SKILL LEVEL Reading Math

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Illustration A

teacher, as well as the school principal in each building, identifies the composite needs assessment data pertinent to the program within their school. On the basis of this data specific objectives for students (thus objectives for the classroom) are generated. School building personnel next proceed to identify those tasks and activities to be engaged in by students and teachers directed at the solution or resolution of student needs. School personnel generate a proposed budget, based on the amount of the human and material resources needed for the accomplishment of student objectives. The budget is organized in accordance with a coding structure for a district-wide programming budgeting system.

The evaluation design directly reflects the need assessment data and the objectives stated by the participants at the building level. Each objective is accompanied by a level of performance. Because the structure for the needs assessment is common to all buildings the levels of performance as well as the baseline data can be summarized for school-wide and district-wide reports.

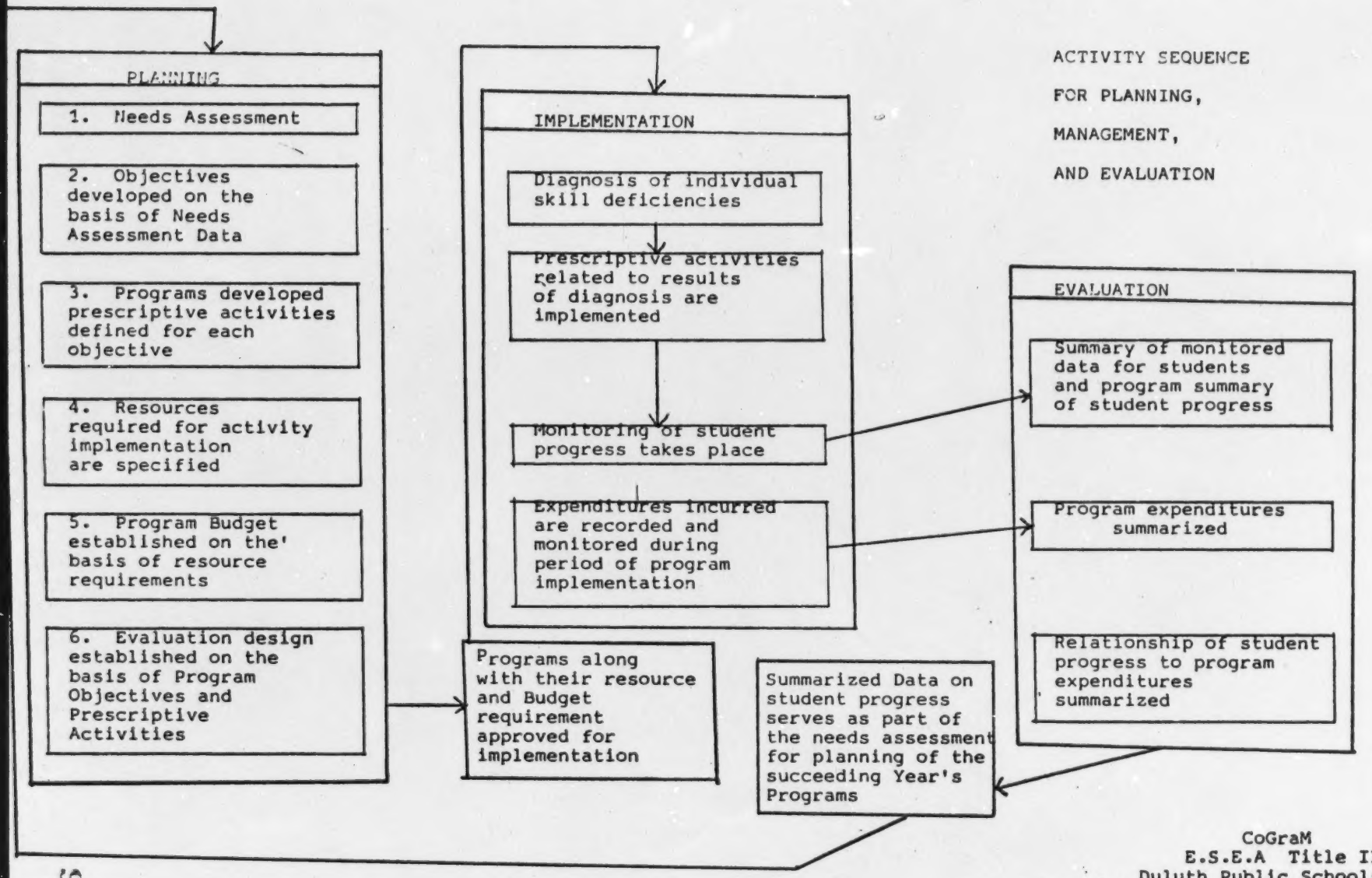
The tasks and activities defined by the staff directed toward achieving the objective are also accompanied by management type objectives stating the time span for the accomplishment of the specific tasks and activities, materials required

for the accomplishment of the tasks, and some statement quantifying or documenting the quality of task performance. All materials and information pertinent to task accomplishment, budget expenditures, activities by students and the attainment of objectives are organized so as to allow for intermediate and final reports that can serve for both summative and formative evaluation. A flow diagram of the major components of the system are presented in Illustration B.

Supportive Rationale

The system is based on the condition that the student is the initial unit for analysis and referent point for the development of any system in education. To begin at a level or two removed from the student is to destroy the impact and efficiency of the system and to destroy the data base on which the entire system is to rest. In a like manner sampling judged detrimental to the operation of the system at the school and classroom level since service cannot be generalized from a sample without considerable error.

The student needs having been identified, the next step in the process is to diagnose the various causes for those needs to exist and to determine alternative strategies for eliminating the need. Strategies must include some degree of task specification which can be related to budget. Programs that are often considered tangential to the actual


PLANNING
1. Needs Assessment
2. Objectives developed on the basis of Needs Assessment Data
3. Programs developed prescriptive activities defined for each objective
4. Resources required for activity implementation are specified
5. Program Budget established on the basis of resource requirements
6. Evaluation design established on the basis of Program Objectives and Prescriptive Activities
IMPLEMENTATION
Diagnosis of individual skill deficiencies
Prescriptive activities related to results of diagnosis are implemented
Monitoring of student progress takes place
Expenditures incurred are recorded and monitored during period of program implementation
EVALUATION
Summary of monitored data for students and program summary of student progress
Program expenditures summarized
Relationship of student progress to program expenditures summarized
Programs along with their resource and Budget requirement approved for implementation
Summarized Data on student progress serves as part of the needs assessment for planning of the succeeding Year's Programs

ACTIVITY SEQUENCE

FOR PLANNING,

MANAGEMENT,

AND EVALUATION

CoGraM
E.S.E.A Title III
Duluth Public Schools-1974

Juola 4/75

Illustration B

teaching situation become much more clearly defined in terms of student need; i.e., breakfast programs for purposes of nutrition; parent involvement programs for purposes of reinforcement from the home; in service programs for teachers for purposes of better preparation in the area of the need; training, selection and appointment of teacher aides to supplement classroom instructional activities. In each case an attempt is made to categorize resources and activities in relation to individual student objectives at the classroom level. By maintaining consistency in the form and format for recording the objectives, activities, and resources it is possible to generate other reports needed by school principals and school district-wide personnel.

The rationale for specifying individual student needs, building programs for individual students and common formats for describing school-wide and district-wide program is accompanied by a second need that usually appears after a program has ended. Data alone on the success of the program allows little room for the educational decision maker to truly consider the alternatives available. The decision maker is concerned not only with success or degrees of success coming out of a program but must also be concerned with the cost of those programs. Often times when arguing for or against an educational program a Board of Education,

the superintendent or school principal is faced with (1) personal testimony of people who either have a vested interest in the program or (2) the alternative, people who have only the slightest amount of involvement and present an argument for another cause. Seldom, if ever, does the decision maker have available to him some identification of the value of the program versus the cost of operating that program compared to alternatives. Seldom, if ever, is the mechanism available for identifying the components of one project as compared to the components of another for the purpose of identifying the differences in tasks and activities and determining whether those tasks and activities can be accomplished at less cost.

The proposed model presently being implemented by the Duluth Public Schools is attempting to implement a cost-effectiveness analysis based on marginal cost-utility values of additional inputs funded from compensatory educational funds. The model for this analysis is presented in greater detail in a companion paper to this document entitled "Cost Effectiveness Model for Educational Programs," Juola, 1975. In each instance the value-added concept is of the greatest importance. Having determined the average cost for educating a youngster and having identified the number or specification or some form of quantification of student needs it is the burden of this project to identify the relationship between the cost of additional services and the benefits to be derived.

Standard statistical procedures greatly hinder the ability to quantify the output of educational programs in a way that would allow correlation with actual costs. Although faulty in construct, the program has thus turned to a description of student output as if each student is a composite picture to be filled in by the completion of ability tasks. The specifications of this model, the requirements for its implementation and the degree of satisfaction that it yields for the decision maker are discussed in the companion paper cited above.

The increasing emphasis on individualization of instruction combined with an increasing demand for the accounting of educational expenditures in relation to student growth has served as the need base for this developmental effort. While much progress has been made to introduce technology to the management of educational programs much remains undone. The purpose of this paper is to illustrate a proposed system, partially implemented, which would serve the management needs of the teacher with the individual student as well as the needs of each successive level of educational decision maker within a school system.

PUPIL CLASSROOM RECORD (DATA)

APPENDIX A

PUPIL CLASSROOM RECORD (DATA)
Title I

I.D. NO._____

Pupil Name_____Chronological Age_____Grade_____

Classroom Teacher_____
(Name) (Signature)

Ed. Assistant or Supplemental Teacher_____

Data:

1. Teacher judgement about pupil status from Needs Assessment (Report: Serious (s), Poor (p), or Average (a).)

	Intellectual Development or Reading	Emotional Development or Math	Work Habits	Behavior/ Adjustment	Composite Score
Initial					
Interim					
Final					

2. Pre and Post Test Data (Total)

	Reading		Math		Test Name, Level and Form
	R.S. or G.E.	P.R.	R.S. or G.E.	P.R.	
Pre test					_____
Post test					_____

Pre-test date: Mo._____Yr._____
Post-test date: Mo._____Yr._____

3. Reading Design

	# of skills mastered		
	word attacks	study	comprehension
Pre			
Interim			
Post			

4. Any additional assessment information (be specific)
Pre:
Interim:
Post:

Check one: Pupil will not require any follow up:_____
Pupil should be followed to insure retention in progress:_____

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DEPARTMENT OF PLANNING AND EVALUATION, DULUTH PUBLIC SCHOOLS
DULUTH, MINNESOTA

PUPIL CLASSROOM RECORD (PROGRAM)

APPENDIX B

PUPIL CLASSROOM RECORD (PROGRAM)
Title I

I.D. No._____

Pupil Name_____Chronological Age_____Grade_____

Classroom Teacher_____
(Name) (Signature)

Ed. Assistant or Supplemental Teacher_____

Program (Initial) Instructional problems and objectives (Include specific information concerning problems and objectives relative to work habits and behavior where appropriate).

1. Initial problem (s):

2. Objective (s):

3. Supplemental Activity
   a) Classroom (Please describe)

   b) Experience Center (Please describe)

Program (Interim Adjustment)

1. Problem (s):

2. Objectives (s):

3. Supplemental Activity
   a) Classroom (Please describe)

   b) Experience Center (Please describe)

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